

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
WASHINGTON

CONSTRUCTION SPECIFICATION

CS-18 COMPACTED EARTHFILL LINER

18.1 SCOPE

The work shall consist of the construction of compacted earthfill liners where the degree of compaction is to be checked and controlled by standard compaction tests.

18.2 MATERIALS

All earthfill liner material shall be obtained from locations shown on the construction plans or as directed by the NRCS field representative. Earthfill liner material shall contain no frozen material, shall not be placed on a frozen surface and shall be free of all sod, brush, roots, or any other organic, perishable, or foreign material. The maximum size of rock fragments incorporated in the earthfill liner shall be three (3) inches, provided that such rock fragments are completely imbedded in the matrix of the compacted earthfill liner.

18.3 FOUNDATION PREPARATION

After excavation, the foundation shall be scarified or plowed to a minimum depth of 2 inches. The foundation area shall be bonded with the first layer of compacted earthfill liner material and compacted to the density and moisture specified. No abutment or foundation surface shall be steeper than 3:1 unless otherwise specified on the drawings.

18.4 PLACEMENT

All foundation excavation and/or preparation shall be completed before placing compacted earthfill liner material. The earthfill liner shall be placed such that the distribution of materials is essentially uniform throughout the entire fill and is free from lenses, pockets, streaks, frozen material or layers of material differing substantially from surrounding material.

Equipment weighing 400 pounds or more per foot of width shall not be operated within 2 feet of any structure.

For horizontal surfaces, the earthfill liner shall be placed in approximately equal horizontal layers. Fill layer thickness before compaction shall not exceed nine (9) inches for machine compaction. Fill layer thickness adjacent to structure walls shall not exceed four (4) inches before compaction by hand directed power tampers.

For sloping surfaces steeper than 10:1, the earthfill liner shall be placed in approximately equal layers. Fill layer thickness before compaction shall not exceed six (6) inches for machine



compaction. Fill layer thickness adjacent to structure walls shall not exceed four (4) inches before compaction by hand directed power tampers.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a depth of not less than two (2) inches before the next layer is placed.

#### 18.5 WATER CONTENT

Water content shall be achieved as outlined in section 18.6, COMPACTION.

The soil liner material shall be brought to the specified moisture range before compaction. Material that is too wet for compaction shall be allowed to dry before compaction or be removed.

If the top surface of a preceding layer or foundation becomes too dry it shall be scarified by disking, or as approved by the NRCS field representative, and moistened prior to placement of the next layer of soil liner material.

#### 18.6 COMPACTION

The constructed density and water content of the compacted earthfill liner shall be within the following limits:

TABLE 1

Density (lbs/ft <sup>3</sup> )	Lower Water Content (%)	Upper Water Content (%)

Density and water content outlined in Table 1 shall also apply for areas of compacted earthfill liner material placed around all structures. Methods for compacting backfill adjacent to structures is governed by Construction Specification CS-17, Structural Backfill.

#### 18.7 TESTING

Field moisture content and density testing of the compacted earthfill liner will be conducted to verify that the desired results have been achieved. Tests shall be conducted on horizontal and sloping surfaces as outlined on the construction plans. The contractor is responsible for quality control of the compacted earthfill liner and shall coordinate with NRCS so the field representative can direct the testing locations. A competent individual shall determine the density and field water content of the compacted liner, and provide the results to the NRCS technical representative. A competent individual is one who has the qualifications, certifications, experience, and capability to perform the tests and evaluate the results.

Field tests to determine the density of compacted earthfill liner shall be conducted during the course of the work by the contractor following methods described in ASTM D-1556 "Sand Cone Method", ASTM D-2167 "Rubber Balloon Method", or ASTM D-2922 "Nuclear Method" using the Direct Transmission Procedure.



Field tests to determine the moisture content of compacted earthfill liner shall be conducted during the course of the work by the contractor following methods described in ASTM D-2216 "Overnight Oven Drying", ASTM D-3017 "Nuclear Method", or ASTM D-4944 "Calcium Carbide Gas Pressure Tester". At least one moisture reading of the liner material using ASTM D-3017 or D-4944 shall be verified by the oven-dry method described in ASTM D-2216.

Test procedures and soil moisture and density records shall be submitted to NRCS for certification of the liner installation.